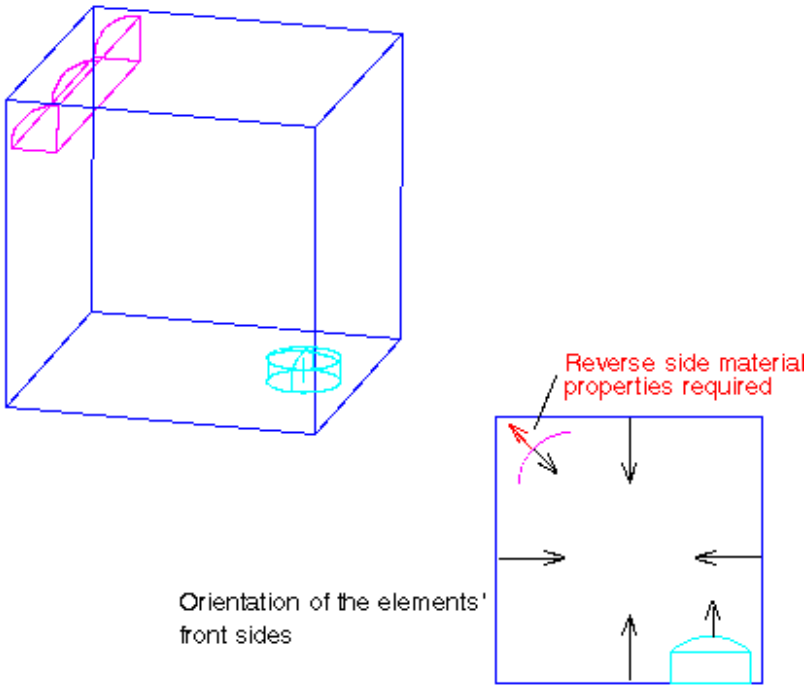
Radiation Request Examples

Example 1 - Radiation Requests for All Elements

Use the *All Radiation* type *Radiation Request* if the model geometry forms a single complete enclosure and there is no need to explicitly calculate radiation leaving that enclosure.

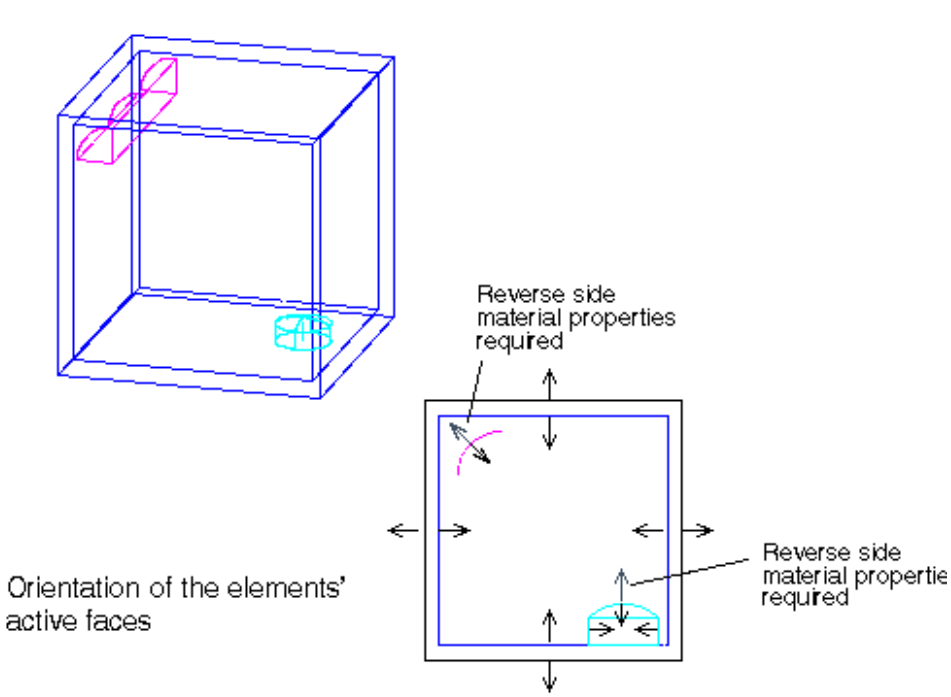


In this simple model, the oven forms a complete enclosure. With all the front side element faces oriented toward the interior of the oven, no leakage exists. The reflector surface in the upper corner needs to have reverse side material properties defined since it participates in the radiation process from both sides. All the other materials should NOT have reverse side material properties defined. (To view active faces, turn on *Element Triad* visibility under *Display Options* in the TMG menus.)

Because of the simplicity of the geometry, the radiative heat exchanged to the exterior of the oven can be calculated by a radiative thermal coupling.

Example 2 - Faster Calculation with Multiple Radiation Requests

You can use the *Enclosure* type *Radiation Request* to speed up radiation calculations and to specify special treatment for some parts of the model.



For this model of a pot in an oven, we assume that the radiation calculation must be performed for both the interior and exterior of both the oven and the pot. Use three enclosures: inside of pot, inside of oven, outside of oven

All front side of the pot elements point inward. Because each of these elements have a direct view to all other elements inside the pot, shadowing checks can be turned off for that enclosure. (To view front side, turn on *Element Triad* visibility under *Display Options* in the TMG menus.)

For the enclosure of the oven interior, the oven elements have their front face pointing inward. Radiative material properties must be define only on the front side of this material since no radiation pass through the walls of the oven. The pot elements, on the other hand, participate in that enclosure but only form their reverse side so they need reverse side material properties to be defined. The reflector also need defined reverse side material properties since both sides of this surface radiate inside the oven.

For the outside of oven enclosure, the oven's external surfaces have their element front faces pointing outward. Again to prevent radiation through the wall of the oven, the reverse side material properties of this material must not be defined. (The interior and exterior of the oven have probably different emissivity and must be meshed with different materials).

In order for the outside of the oven to radiate to something, you must activate the *Include Space Elements* option on the *Radiation Request* form. Also, under *Radiation Controls*, turn on the *Space Enclosure* option. Since the external elements all have an unobstructed view to space, shadowing checks can be turned off for this enclosure as well. (The oven itself is an obstruction between two *Space* elements but the special nature of the *Space* elements causes that shadowing to be ignored).

With the active faces of the elements oriented as described, no radiation will be calculated between the oven's interior elements and its exterior ones. This is consistent with the fact that heat exchange between these two enclosures occurs through conduction (model with a thermal coupling).

Defining this thermal model with three *Radiation Requests*, one for each enclosure, allows the user to turn off shadowing checks when they are not needed. For the interior oven enclosure, a more precise error criterion can be specified without adding unnecessary calculation elsewhere in the model. And the external enclosure is the only one needing the *Include Space*

Elements option.

Using one *Radiation Request* for *All Radiation* would yield the same final temperature distribution. But TMG would have to perform additional calculations to determine if any enclosures existed and whether or not shadowing occurs.
